

31
63. The thin film transistor according to claim ~~33~~¹¹ wherein said gate insulating layer comprises a silicon oxide layer directly contacting with said channel region.

32
64. The thin film transistor according to claim ~~34~~¹² wherein said gate insulating layer comprises a silicon oxide layer directly contacting with said channel region.

Amended
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65. The thin film transistor according to claim ~~35~~¹³ wherein said gate insulating layer comprises a silicon oxide layer directly contacting with said channel region.

34
66. The thin film transistor according to claim ~~49~~¹⁷ wherein said gate insulating layer comprises a silicon oxide layer directly contacting with said channel region.--

REMARKS

The Examiner's Official Action dated September 29, 1998 has been received and its contents carefully noted.

Claims 23-38 and 49-59 were pending in this application. Claims 23, 25, 27, 29-38 and 49-59 have been amended and new claims 60-66 have been added hereby. Consequently, claims 23-38 and 49-66 are now pending in this application.

Preliminarily, Applicants note that new claims 49-59 were added by the Amendment mailed June 26, 1998, to which the present Office Action is responsive. However, the Office Action fails to treat or even to acknowledge

43

the presence of claims 49-59. Those claims have now been amended further as set forth above. It is respectfully requested that claims 49-59, as well as all other properly pending claims in this application, namely claims 23-38 and 49-66, be examined on the merits.

Further, Applicants note that while the PTO Form 1449 submitted with the Information Disclosure Statement mailed June 26, 1998 was returned with the Office Action mailed September 29, the Examiner's initials are missing from the top portion of the second of the three pages. Applicants respectfully request that the Examiner in the next communication include a fully initialed copy of the second page of the three Form 1449 pages thereby indicating receipt and consideration of all the references cited therein.

The Office Action rejected claims 23-31 and 33-37 under 35 U.S.C. §103(a) over Sugano et al. in view of Yamazaki U.S. Patent 5,543,636 (note that the Office Action cites 5,543,535, which is believed to be a typographical error) and further rejected claims 32 and 38 under §103(a) over Sugano, Yamazaki and Prokes et al. These grounds of rejection are respectfully traversed for the following reasons.

The present invention relates to a thin film transistor with a channel region containing oxygen, carbon or nitrogen at a concentration of 1×10^{19} atoms/cm⁻³ or less and having Raman shift at a wave number of 512 cm⁻¹ or higher, Ia/Ic less than 0.4, and full band width at half maximum (FWHM) less than 3. See, for example, claims 23, 27 and 34, each of which recites at least one of the above features.

The claims now pending in this application have been amended to recite that the channel region, which comprises a crystalline semiconductor film, exhibits the above features (i.e., carbon, oxygen or nitrogen

concentration, Raman shift, etc.), rather than the semiconductor layer.

Although Yamazaki teaches to crystallize source and drain regions, Yamazaki fails to teach to crystallize a channel region. Therefore, it is believed that the features recited in the presently pending claims are patentably distinguishable over any combination of the applied Sugano and Yamazaki references.

Furthermore, new claims 60-66 have been added hereby. Those claims recite that a gate insulating layer comprises a silicon oxide layer directly contacting the channel region. This structure is different from Yamazaki '636 which recites a silicon nitride layer as the gate insulating layer. The use of a silicon oxide layer provides a more uniform stress on the crystalline channel region compared to a silicon nitride layer. As a result, the present invention has the advantage of improved product reliability.

Further still, claim 32 of the present invention recites an annealing step in a hydrogen gas atmosphere after crystallization with a laser annealing in order to obtain high carrier mobility at an improved reproducibility. Sugano et al. and Yamazaki '636 fail to disclose or to suggest this aspect of the present invention.

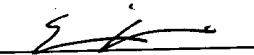
With regard to the rejection based on Sugano et al. and Yamazaki '636 in view of Prokes et al., the amended claims herein recite that the channel region comprises a germanium and a germanium and silicon alloy on an insulating surface. On the other hand, Prokes presupposes that the germanium and the germanium and silicon alloy layer is formed on a silicon wafer, not on an insulating layer as in the present invention.

For at least the foregoing reasons Applicants respectfully request that the §103(a) rejections of any claims pending herein be reconsidered and withdrawn.

In view of the claim amendments set forth herein Applicants respectfully submit that the Terminal Disclaimer filed September 11, 1997 no longer is necessary in that the obviousness-type double patenting rejection previously applied no longer is applicable. Accordingly, Applicants intend to file a Petition under 37 CFR §1.182, in accordance with MPEP §1490, to withdraw the Terminal Disclaimer.

In view of the above, all of the claims in this case are believed to be in condition for allowance. Should the Examiner deem that any further cation by the applicants' would be desirable to place this application in even better condition for issue, she is requested to contact the undersigned.

Respectfully submitted,



Eric J. Robinson
Reg. No. 38,285

Sixbey, Friedman, Leedom & Ferguson, P.C.
8180 Greensboro Drive, Suite 800
McLean, Virginia 22102
(703) 790-9110